Modification of the Stratification and Velocity Profile Within the Straits and Seas of the Indonesian Archipelago

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LONG-TERM GOALS

To better resolve in observations and models the ocean physcial processes in the eastern Indonesian seas as needed to improve our understanding of the circulation and mixing patterns in that region.

OBJECTIVES

The gap in understanding basic ocean physics is most acute in the northeastern Indonesia seas: the Halmahera Sea, Maluku Sea, the Seram Sea and the northern Banda Sea. These seas are exposed to the energetic Pacific western boundary currents that project into the region way of the Mindanao and Halmahera Eddies. The winds blowing through the gaps between the islands of the northeast seas locale is configured into a pattern of clockwise and counterclockwise wind stress featured that probably result in an energetic sub-mesoscale eddies of ocean circulation. The complex submarine topography coupled with the strong tidal dissipation and wind induced eddies lead to a vigorous turbulent environment, one that is poorly understood, yet it is necessary to develop a quantitative grasp of the associated small scale ocean processes to properly model the regional circulation, and its role in the climate and marine ecosystems.

APPROACH

Use exisiting observational data sets and model output to produce and overview of the ocean circulation and mixing within the northeastern Indonesia seas, and idenitfy gaps in our understanding that hinder quantitative grasp of the regional oceanography.

WORK COMPLETED

I presented an overview of the ocean circulation and mixing within the northeastern Indonesia seas in a series of lectures in Indonesia in July and August 2010.

RESULTS

Formulated research questions to be addressed in additional research into the ocean physical processes

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within the northeastern seas of Indonesia:

[A] How does the stratification, velocity/transport respond to remote and local forcing?
[B] What are the dominant physical and dynamical balances that characterize the flow & mixing at different locations and scales?
[C] How do the ocean dynamics relate to the marine ecosystems, such as that found at Coral Reefs.
[D] How well do models simulate the observed characteristics?

It was agreed that improved understanding of the marine environment in the northeastern seas of Indonesia (Figure 1) will provide the basis understanding the nutrient fluxes and larvae trajectories, and associated food chain structures that will allow for informed management of marine living resources: e.g. fisheries and coral reefs, for food and recreation. There would be improved prediction of pollution spreading and improved understanding of the flux of carbon dioxide between ocean and atmosphere (are the Indonesian seas a source or sink of atmospheric CO_2?). The research will lead to improved ocean and climate modeling so as to better predict hydrological changes affecting Indonesia.

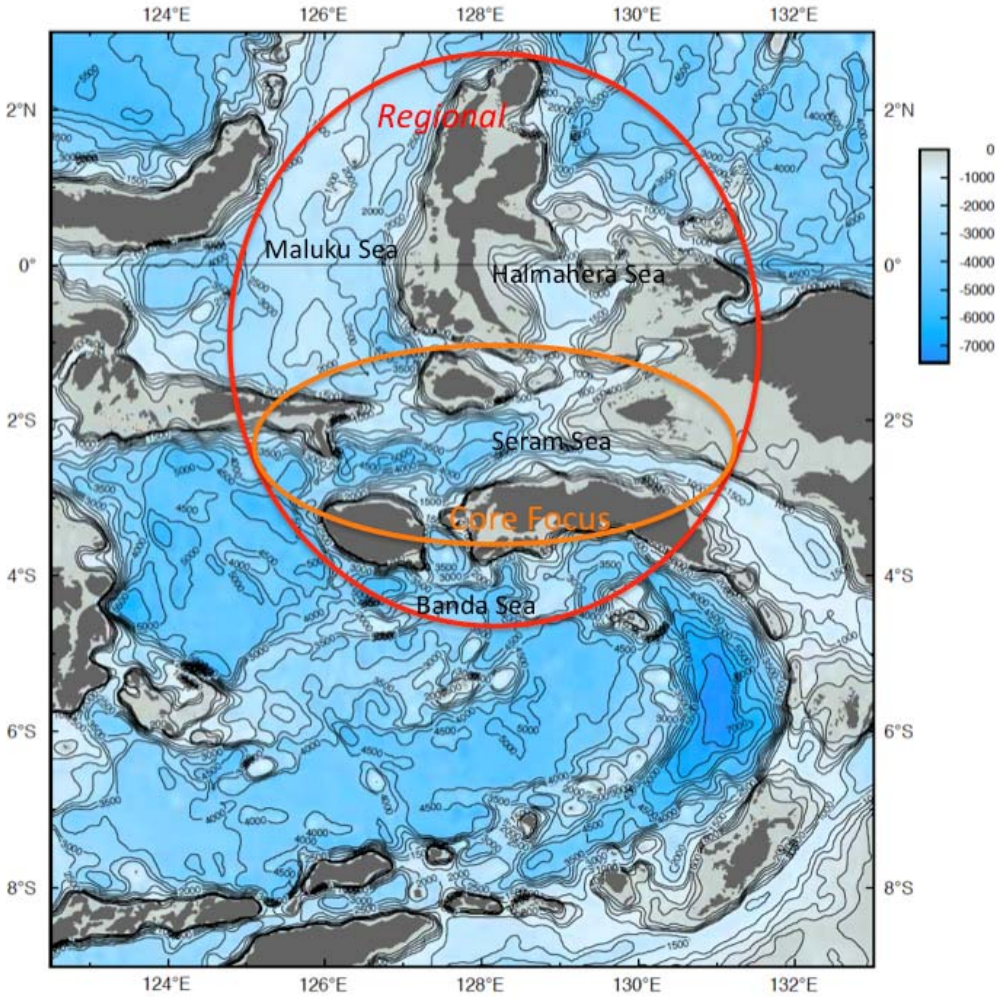

Figure 1 The Red oval defines the sections of the northeastern seas of the Indonesian seas in which building a more quantitative understanding of the marine environment as required for a wide range of applications. The Orange oval defines the Seram Sea section linking the varied seas.

IMPACT/APPLICATIONS

The program has direct applications for the development of a quantitative and coordinated field program for Indonesia and its international partners, in the relatively unknown northeastern seas of Indonesia.

TRANSITIONS

None

RELATED PROJECTS

None

REFERENCES

PUBLICATIONS

PATENTS

None